Systematic revision and cladistic analysis of the South American weevil genus *Tartarisus* (Coleoptera: Curculionidae: Molytinae)

DONATO, Mariano* and Federico C. OCAMPO**

* Laboratorio de Sistemática y Biología Evolutiva (LASBE), Museo de La Plata, Paseo del Bosque, 1900 La Plata, Argentina; e-mail: mdonato@museo.fcnym.unlp.edu.ar

** Division of Entomology, University of Nebraska State Museum, W- 436 Nebraska Hall, Lincoln, NE 68588- 0546, USA; e- mail: focampo@unlserve.unl.edu

■ **ABSTRACT.** The genus *Tartarisus* Pascoe is endemic to the Maule and Valdivian districts of the Subantartic province of southern South America. This genus includes five species: *Tartarisus concinnus* (Philippi) (revalidated here from synonymy with *T. signatipennis*), *T. griseus* (Philippi), *T. perforatipennis* (Blanchard), *T. signatipennis* (Blanchard), and *T. subfasciatus* (Blanchard). A key, redescriptions, photographs, and illustrations of the species are provided. A cladistic analysis using 20 characters from external morphology and male and female genitalia produced one cladogram (CI = 0.76, RI = 0.72, length 28 steps). The cladogram shows the following phylogenetic sequence: (*T. perforatipennis* ((*T. griseus T. subfasciatus*) (*T. signatipennis T. concinnus*))).

KEY WORDS. Curculionidae. Molytinae. *Tartarisus*. Systematics. Cladistics.

■ **RESUMEN. Revisión sistemática y análisis cladístico del género de gorgojo sudamericano *Tartarisus* (Coleoptera: Curculionidae: Molytinae).** El género *Tartarisus* Pascoe es endémico de los distritos Valdiviano y Maule de la provincia Subantártica del sur de Sudamérica. Este género incluye cinco especies: *Tartarisus concinnus* (Philippi) (aquí revalidado de la sinonimia con *T. signatipennis*), *T. griseus* (Philippi), *T. perforatipennis* (Blanchard), *T. signatipennis* (Blanchard) y *T. subfasciatus* (Blanchard). Se brindan las redescripciones, clave de identificación, fotografías e ilustraciones de las especies. El análisis cladístico usando 20 caracteres derivados de la morfología externa y genitalia masculina y femenina produjo un cladograma (CI = 0.76, RI = 0.72, largo 28 pasos). El cladograma muestra la siguiente secuencia filogenética: (*T. perforatipennis* ((*T. griseus T. subfasciatus*) (*T. signatipennis T. concinnus*))).

PALABRAS CLAVE. Curculionidae. Molytinae. *Tartarisus*. Sistemática. Cladistica.

INTRODUCTION

The weevil genus Tartarisus Pascoe belongs to the subfamily Molytinae (Coleoptera: Curculionidae) (Morrone, 1996; 1997). This genus is endemic to the Maule and Valdivian provinces, both belong to the Subantarctic subregion (Morrone, 1999).

The genus *Tartarisus* was described by Pascoe (1881), and included two species: *T. signatipennis* (Blanchard, 1851) and *T. subfasciatus* (Blanchard, 1851). Kuschel (1950) incorporated two new species: *T. perforatipennis* (Blanchard, 1851) and *T. griseus* (Philippi, 1859), and considered *Heilipus concinnus* Philippi, 1859 and *Heilipus bisignatus* Redtenbacher 1867, as junior synonyms of *T. signatipennis* (Blanchard, 1851). The study of new characters of the female genitalia made us to draw the conclusion that there are two different species.

The objectives of this study are to review the genus, to revalidate and redescribe the species *T. concinnus* (Philippi), and to analyze the cladistic relationships among the species of this genus.

MATERIAL AND METHODS

The specimens examined in this study have been borrowed from the following collections (codes that identify collections are referred to in the text):

BMNH The Natural History Museum, London, Great Britain (Christopher Lyal).
IADIZA Instituto de Investigaciones de las Zonas Áridas, Mendoza, Argentina (Sergio Roig Juñent).
IPCN Instituto Patagónico de Ciencias Naturales, San Martín de Los Andes, Argentina (Mario Gentili).
MHNS Museo Nacional de Historia Natural, Santiago, Chile (Mario Elgueta).
MLP Museo de La Plata, La Plata, Argentina (Juan Schnack)
MZFC Museo de Zoología, Facultad de Ciencias, UNAM, México D. F., México (Juan José Morrone)

Drawings were made with a camera lucida attached to a stereoscopic microscope.

Characters were derived from the external morphology and male and female genitalia (Table I). Apomorphic character states were identified by outgroup comparison (Nixon & Carpenter, 1993) with the genera *Calvertius* (Fairmaire & Germain, 1860) and *Nothofagius* Kuschel, 1952. All multistate characters were treated as non–additive. Character 7 was considered as polymorphic for *T. perforatipennis*. Cladistic analysis was carried out using Wagner parsimony with NONA version 2.0 (Goloboff, 1993), applying the commands ambiguous – to collapse unsupported nodes, poly = to treat trees as polytomous and mswap + to produce an exact solution; consistency and retention indices were calculated using the command fit that calculate these indices for informative characters only. Winclada version 0.9.99m24 (Beta) (Nixon, 1999–2000) was used for examination of character distributions.

RESULTS

Tartarisus Pascoe, 1881

Tartarisus Pascoe, 1881: 101 (type species: *Heilipus signatipennis* Blanchard 1851, by original designation); Ocampo & Morrone, 1999: 22.

Diagnosis. Frons straight, lacking fovea, width variable. Rostrum uniformly curved. Funicular article 1 shorter than 2. Pronotum lacking tubercles; postocular lobes normally developed; fore margin straight. Elytra globose, wider than pronotum, lacking tubercles. Metasternite not longer than ventrite 1 in the middle. Femora with tooth on internal side, larger on fore and middle legs than in hind legs; hind femora reaching ventrite 5.

Distribution. Endemic to Maule and Valdivian districts of the Subantartic biogeographic province (Morrone & Roig Juñent, 1995; Ocampo & Morrone, 1999).

Key to identify the species of *Tartarisus*

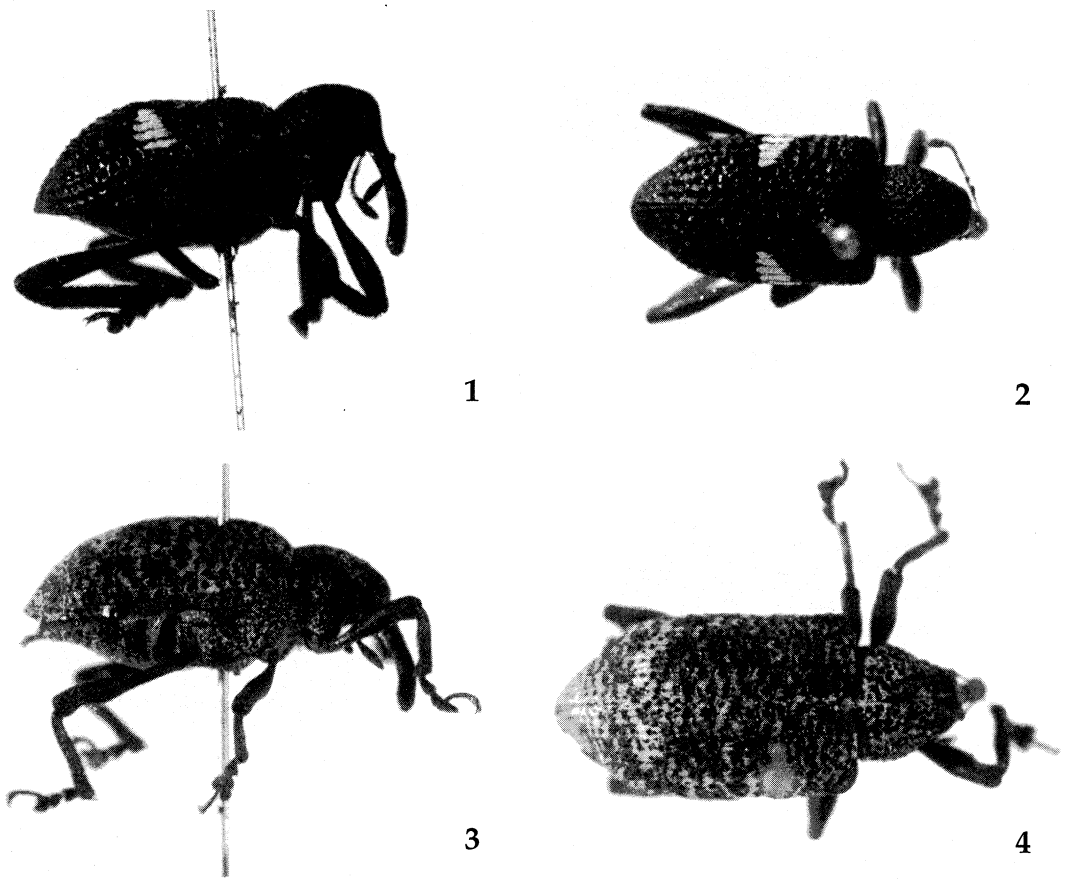
1. Elytra with depression on apical third, fore tibiae flat 2
   Elytra lacking depression on apical third, fore tibiae not flat 3
2. Elytra with one white band of scales on each side, club short and fusiform ..... *T. concinnus*
   Elytra lacking white band of scales on each side, club long and ovate ..... *T. signatipennis*
3. Body clothed with whitish and greyish scales; scape reaching eyes ..... *T. griseus*
   Body lacking scales or with only one or two bands of white scales on elytra; scape not reaching eyes 4
4. Eyes ovate; elytra with two white bands of scales on each side ..... *T. subfasciatus*
   Eyes kidney-shaped; elytra lacking two bands of scales on each side ..... *T. perforatipennis*

Tartarisus concinnus (Philippi, 1859), revalidated here

Heilipus concinnus Philippi, 1859: 668
Heilipus bisignatus Redtenbacher, 1867: 159
Tartarisus concinnus Kuschel, 1950: 15 (as synonym of *T. signatipennis*) (revalidated)

Diagnosis. Eyes subcircular, club short and fusiform; elytral depression on apical third; elytra with one white band of scales.

Redescription. Habitus (Figs. 1-2). Integument black or dark brown. Frons slightly punctured, lacking fovea. Eyes subcircular. Rostrum long and curved; narrower than distance between eyes;



Figs. 1- 4. *Tartarisus spp,* habitus in dorsal and lateral view respectively. 1, 2: *T. concinnus* (total length: 11,5 mm.); 3, 4: *T. griseus* (total length: 16,4).

apex as wide as base. Scape not reaching eyes; funicular article 1 shorter and wider than 2; club short and fusiform. Pronotum globose; apex narrower than base; fore margin rounded; with punctures. Elytra with depression on apical third; subglobose; striae conspicuous; with large and deep punctures; humeri prominent; with white oblique band of scales on middle of each side. Legs black or dark brown; fore tibiae flat, with well developed black setae.

Male: aedeagus (Figs. 11–12) with apodemes as long as aedeagal body; apex rounded.

Female: sternite 8 plate long with short apical setae, sternite 8 apodeme 3/4 of plate (Fig. 17); hemiesternite slightly sclerotized, narrow at the base (Fig. 25); spermatheca with ramus and nodulus well developed, cornu hook-like (Fig. 21).

Length: 11-12 mm.

Remarks. Kuschel (1950) considers this species as synonymy of *T. signatipennis*; however, differences on external morphology and female genitalia indicate that they are two different species.

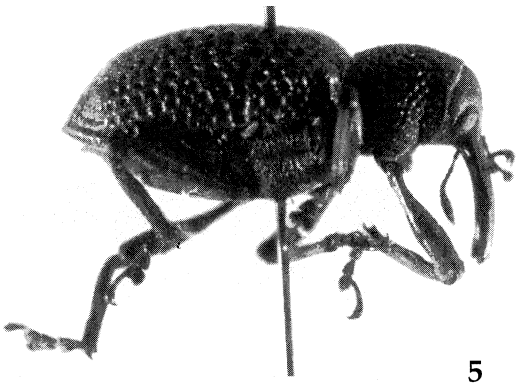
Material examined: CHILE. Without more precise data, 2 (BMNH); Alto Vilches-Talca, XII-1979, 5 (MZFC); Pemehue, Germain coll., 1984, 2 (MHNS); Temuco, 15-XII-1985, S. Roig coll., 2 (IADIZA).

Tartarisus griseus (Philippi, 1859)

Heilipus griseus Philippi, 1859: 667.
Tartarisus griseus Kuschel, 1950:15; Morrone & Roig Juñent, 1995: 59; Ocampo & Morrone, 1999: 22.

Diagnosis. Eyes kidney-shaped, scape reaching eyes, body clothed by whitish and greyish scales.

Redescription. Habitus (Figs. 3- 4). Integument black; body clothed by white and whitish scales. Frons slightly punctured, lacking fovea. Eyes



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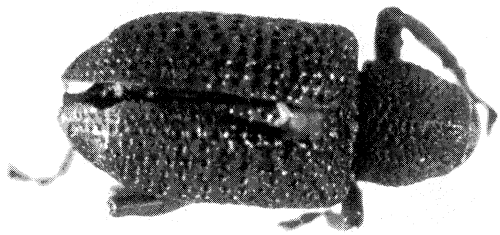

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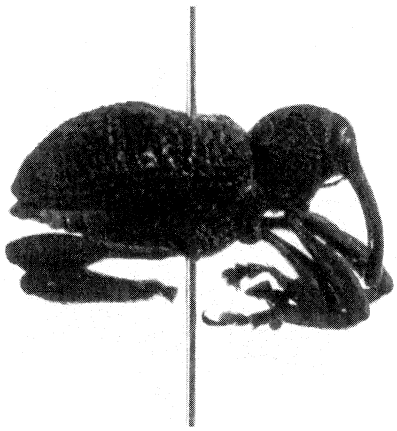

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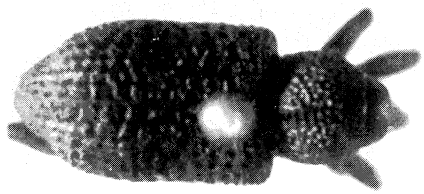

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Figs. 5- 8. *Tartarisus spp*, habitus in dorsal and lateral view respectively. 5, 6: *T. perforatipennis* (total length: 16,5 mm.); 7, 8: *T. signatipennis* (total length: 13 mm.).

kidney-shaped. Rostrum long and curved, wider than distance between eyes; apex wider than base. Scape reaching eyes; funicular article 1 shorter and wider than 2; club long and fusiform. Pronotum subglobose; apex narrower than base; with punctures. Elytra subglobose; striae conspicuous, with large and deep punctures; humeri prominent. Fore tibia not flat. Legs black or dark brown.

Male. Aedeagus (Figs. 13- 14) with apodemes shorter than aedeagal body; apex pointed.

Female. Unknown.

Length. 16-17 mm.

Material examined: Without locality data, 2 (1 MHNS, 1 BMNH).

Tartarisus perforatipennis (Blanchard, 1851)

Heilipus perforatipennis Blanchard, 1851: 384.
Heilipus verruculatus Philippi, 1859: 668.
Tartarisus perforatipennis; Kuschel, 1950: 15; Morrone & Roig Juñent, 1995: 59; Ocampo & Morrone, 1999: 22.

Diagnosis. Eyes kidney-shaped, scape reaching eyes, club long and fusiform, and body entirely black or with a little white band of scales on each side of elytra.

Redescription. Habitus (Figs. 5- 6). Integument black. Frons slightly punctured, lacking fovea. Eyes kidney-shaped. Rostrum long and curved; wider than distance between eyes; apex as wide as base. Scape reaching eyes. Funicular article 1 as longer as 2 or article 1 shorter than 2. Pronotum subglobose; apex narrower than base; with punctures. Elytra subglobose; striae conspicuous, with large and deep punctures; humeri prominent; lacking scales or with little white band of scales on side. Legs black or dark brown. Fore tibia not flat.

Male. Unknown.

Female. Sternite 8 plate wide with short apical setae (Fig. 18); hemiesternite normally sclerotized

(Fig. 26); spermatheca with ramus and nodulus slightly developed, cornu hook-like (Fig. 22).

Length. 15-18 mm.

Material examined: Without locality data, 4 (1 BMNH, 3 MHNS); **ARGENTINA.** Neuquén, San Martín de los Andes, 640 m, 1 (IPCN); 630 m., 2-XI-1968, M. Gentili (IPCN).

Tartarisus signatipennis (Blanchard, 1851)

Heilipus signatipennis Blanchard, 1851: 384.
Tartarisus signatipennis; Pascoe, 1881: 101; Morrone & Roig Juñent, 1995: 59; Ocampo & Morrone, 1999: 22.

Diagnosis. Eyes subcircular, club short and ovate, elytral depression on apical third, and body entirely black.

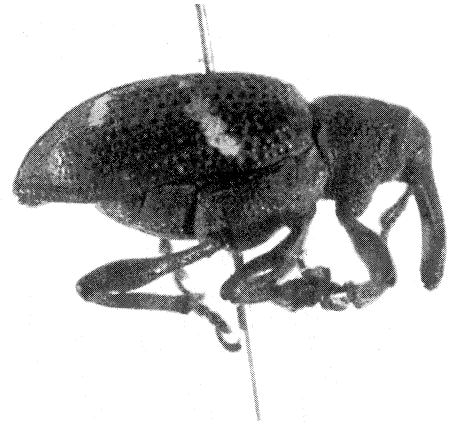
Redescription. Habitus (Figs. 7- 8). Integument black. Frons slightly punctured, lacking fovea. Eyes subcircular. Rostrum long and curved; narrower than distance between eyes; apex as wide as base. Scape not reaching eyes; club short and ovate. Funicular article 1 shorter than 2. Pronotum globose; apex narrower than base; with punctures. Elytra with depression on apical third; subglobose; striae conspicuous; with large and deep punctures; humeri prominent. Legs black or dark brown; fore tibiae flat, with well developed black setae.

Male. Unknown.

Female. Sternite 8 plate long with short apical setae, sternite 8 apodema 1/2 of plate (Fig. 19); hemiesternite slightly sclerotized, narrow at middle (Fig. 27); spermatheca with nodulus well developed and ramus not developed, cornu hook-like (Fig. 23).

Length. 12- 14 mm.

Material examined: ARGENTINA. Chubut, Lago Puelo, 8-XII-1959, A. Kovaca coll., 1 (BMNH); Neuquén, Curruee-Escorial, 1-III-82, P. Gentili coll., 1 (IPCN); Pucará, 630 m, 15-XI-72, S. Schajosvskoi coll., 1 (IPCN); Pucará, 640 m, 1 (IPCN); Río Negro, 1 (MLP). CHILE. 50 Km South of Temuco, 11-XII-1984, S. Roig coll., 1 (IADIZA); 4-XII-1984, S. Roig coll., 1 (IADIZA); Pemehue, 1894, Germain coll., 4 (MHNS); P.N. Nahuel Buta, 1230 m, 23-XII-1985, S. Roig coll., 3 (IADIZA).



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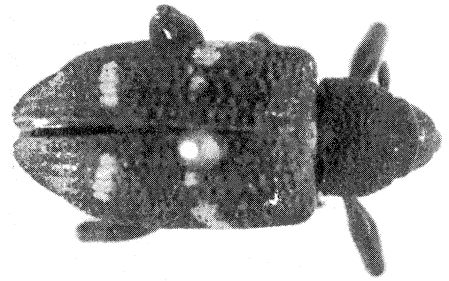

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Figs. 9- 10. Tartarisus *subfasciatus*, habitus in Figure 9 dorsal view and Figure 10 in lateral view (total length: 13,2 mm.).

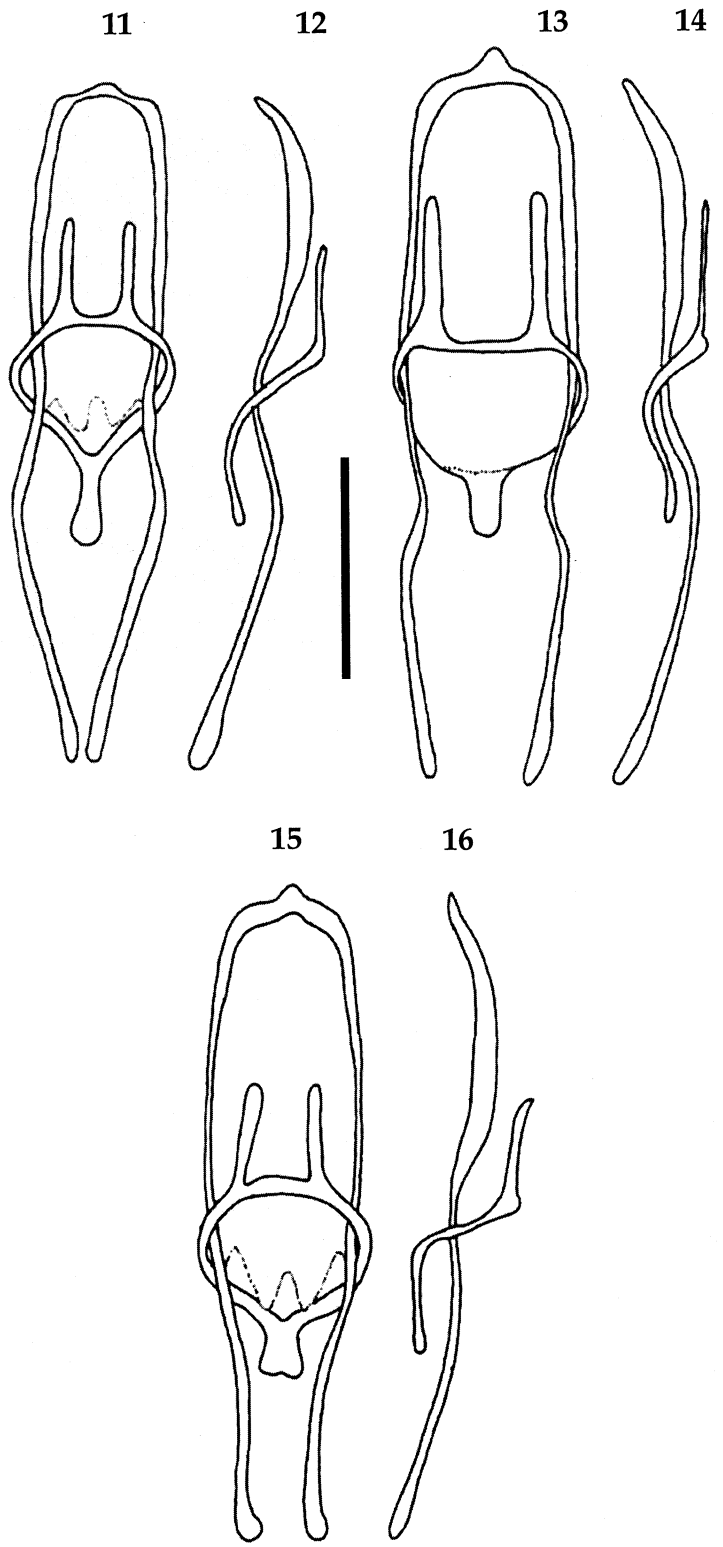
Tartarisus subfasciatus (Blanchard, 1851)

Heilipus subfasciatus Blanchard, 1851: 383.
Tartarisus subfasciatus; Dalla Torre *et al.*, 1932: 44; Morrone & Roig Juñent, 1995: 59; Ocampo & Morrone, 1999: 22.

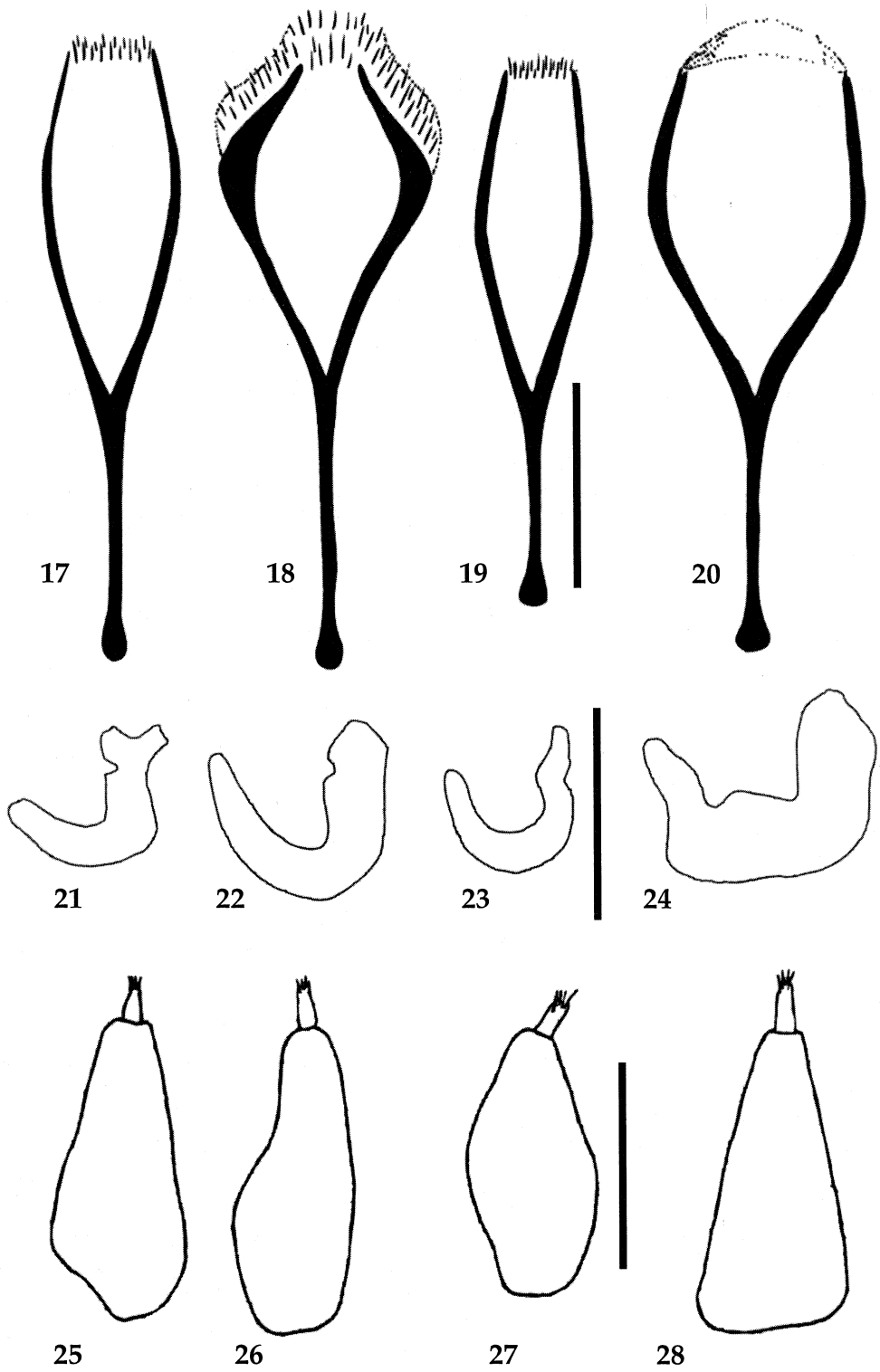
Diagnosis. Eyes kidney-shaped, scape not reaching eyes and two white bands of scales on each side of elytra.

Redescription. Habitus (Figs. 9-10). Integument black or dark brown. Frons slightly punctured, lacking fovea. Eyes kidney-shaped. Rostrum long and curved; wider than distance between eyes; apex as wide as base. Scape not reaching eyes; club short, and base wider than apex. Funicular article 1 as long as 2. Pronotum subglobose; apex narrower than base; with punctures. Elytra subglobose; striae conspicuous, with large and deep punctures; humeri prominent; with two white bands of scales on each side, one oblique on middle, and one transversal on apical third. Legs black or dark brown. Fore tibia not flat.

Male. Aedeagus (Figs.15–16) with apodemes



Figs. 11- 16. *Tartarisus spp*, male genitalia. 11, 13, 15 dorsal view; 12, 14, 16 lateral view. 11, 12: *T. concinnus*; 13, 14: *T. griseus*; 15, 16: *T. subfasciatus*. Scale line 1,5 mm



Figs. 17- 28. *Tartarisus spp*, female genitalia. 17- 20 sternite 8; 21- 24 spermatheca. 25- 28 hemisternite. 17, 21, 25: *T. concinnus*; 18, 22, 26: *T. perforatipennis*; 19, 23, 27: *T. signatipennis*; 20, 24, 28: *T. subfasciatus*. Scale line 1,5 mm

Table I. Data matrix used in the cladistic analysis of *Tartarisus*. 0 = plesiomorphic; 1, 2 = apormorphic.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Calvertius	0	1	0	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
Nothofagius	1	0	1	0	0	1	0	0	0	0	1	2	0	0	0	0	0	1	0	0
T. concinnus	1	2	1	1	0	1	2	1	1	1	1	1	0	0	1	1	1	1	1	1
T. griseus	1	2	0	1	1	0	2	1	1	0	0	0	1	1	?	?	?	1	1	1
T. perforatipennis	1	2	0	1	1	1	[12]	1	1	0	0	0	?	?	0	0	0	1	1	1
T. signatipennis	1	2	1	1	0	1	2	1	1	1	1	0	?	?	1	1	1	1	1	1
T. subfasciatus	1	2	0	1	1	1	1	1	1	0	0	2	1	1	0	1	0	1	1	1

Appendix I. List of characters used in the cladistic analysis of the genus Tartarisus.

1. Fovea: (0) present, (1) absent.
2. Rostrum: (0) straight, (1) curved on the apical third, (2) uniformly curved.
3. Width between the eyes: (0) narrower than width of rostrum, (1) wider than width of rostrum.
4. Width on apex of rostrum: (0) wider than base, (1) as wide as base.
5. Eyes: (0) subcircular, (1) kidney-shaped.
6. Scape: (0) reaching eyes, (1) not reaching eyes.
7. Funicular articles 1-2: (0) article 1 longer than 2, (1) article 1 as long as 2, (2) article 1 shorter than 2.
8. Rostrum length: (0) short, (1) long.
9. Fore margin of pronotum: (0) slightly sinuous, (1) straight.
10. Elytral depression: (0) absent, (1) present.
11. Fore tibiae: (0) not flat, (1) flat.
12. White band of scales on elytra: (0) absent, (1) one band, (2) two bands.
13. Aedeagus: (0) apodemes as long as aedeagal body, (1) apodemes shorter than aedeagal body.
14. Apex of eadeagus: (0) rounded, (1) pointed.
15. Female sternite 8 plate: (0) wide (Fig. 18), (1) long (Fig. 17).
16. Female sternite 8 arms: (0) irregular wide (Fig. 18), (1) regular wide.(Fig. 17)
17. Hemisternites: (0) normally sclerotized, (1) slightly sclerotized.
18. Elytra and pronotum: (0) tuberculate, (1) not tuberculate.
19. Tooth of fore and middle femora: (0) slightly developed, (1) well developed.
20. Hind femora: (0) not reaching ventrite 5, (1) reaching ventrite 5.

shorter than aedeagal body; apex pointed.

Female. Sternite 8 plate wide with short apical setae, sternite 8 arms regular wide (Fig. 20); hemiesternite normally sclerotized (Fig. 28); spermatheca with cornu enlarged, ramus and nodulus slightly developed (Fig. 24).

Length. 15-19 mm.

Material examined: without locality data, 3 (1 MHNS, 2 MLP); **CHILE.** Valley of Marga, XII- 1933, Pa Pirrion coll., 4 (BMNH); Cordillera de Chillán, 1899, Germain coll., 1 (MHNS); C. S. Reed coll., 1 (MHNS); I-1926, A. Faz coll., 2 (MLP); Valparaiso, XII-1926, Perales coll., 1 (MHNS).

Cladistic analysis

The analysis of the data matrix (Table I) produced one cladogram (CI= 0. 76, RI= 0. 72, length 28 steps). In the cladogram (Fig. 29), the following phylogenetic sequence results: (*Calvertius* (*Nothofagius* (*T. perforatipennis* ((*T. griseus T. subfasciatus*) (*T. signatipennis T. concinnus*))))).

The species here assigned to the genus *Tartarisus* constitute a natural group (Fig. 29), supported by the following characters: funicular article 1 shorter than 2, fore margin of pronotum straight, and femora tooth on internal side of fore and middle legs well developed. *T. griseus, T. subfasciatus, T. concinnus,* and *T. signatipennis* share the character: female sternite 8 arms with regular width. This clade has as sister group the species *T. perforatipennis.* Within this group the characters "apodemes of aedeagus shorter than aedeagal body" and "apex of aedeagus pointed" support the clade conformed by *T. griseus* and *T. subfasciatus. T. concinnus* is the sister group of *T. signatipennis,* that share the following characters: elytral depression absent, female sternite 8 plate elongate, and hemisternites slightly sclerotized.

Systematics

Revalidation of the species *T. concinnus* is based

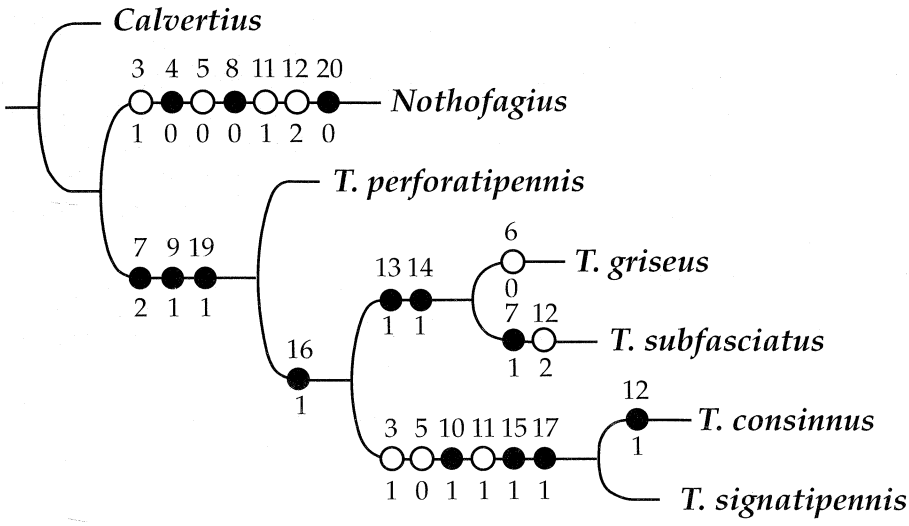


Fig. 29. Cladogram of the species of *Tartarisus*. Black circles = synapomorphies; white circles = homoplasies. The numbers up of the circle they correspond with the number of character of the Table I and the inferior with the state of the corresponding character.

on the presence of differences in female genitalia. *T. concinnus* has the sternite 8 apodeme 3/4 of plate, the spermatheca with nodulus and ramus well developed, and the hemiesternite narrow at the base. Whereas *T. signatipennis* has the sternite 8 apodema 1/2 of plate, the spermatheca with nodulus well developed and ramus not developed, and the hemiesternite narrow at the middle. Moreover, *T. concinnus* presents a white oblique band of scales on the middle of each side of elytra, whereas *T. signatipennis* lacks a white oblique band of scales on the middle of each side of elytra.

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